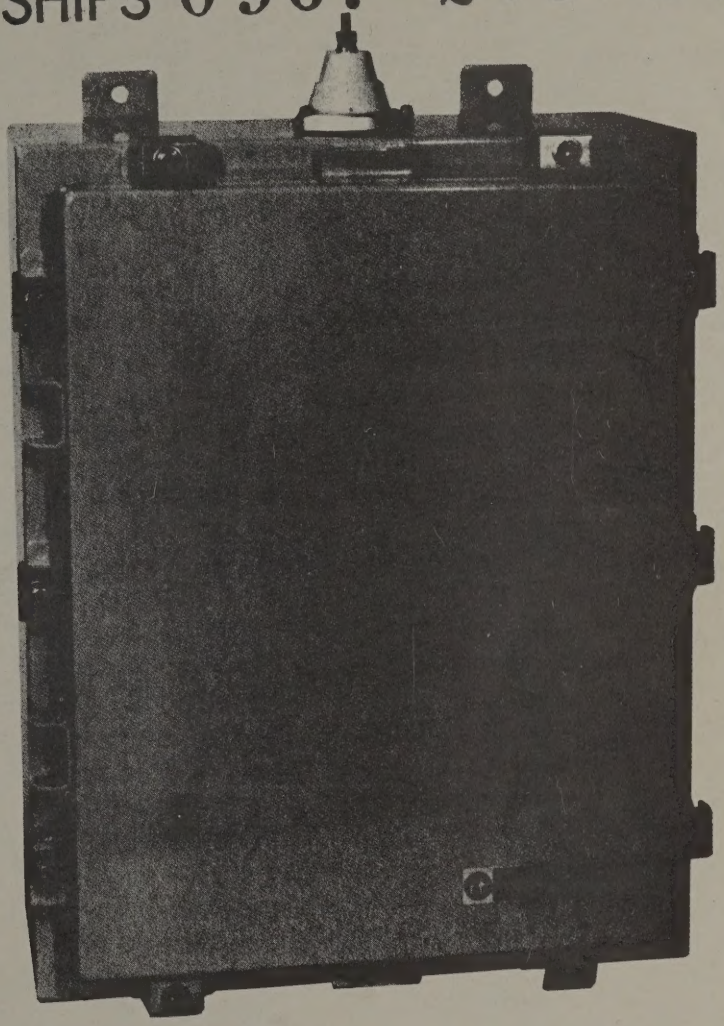
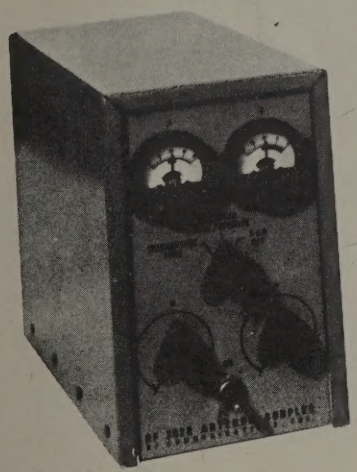
0967-275-2010
With 0967-275-2012

INSTRUCTION MANUAL/PM-0335

NAVSHIPS 0967-275-2010





rf

RF-302R

REMOTE CONTROLLED ANTENNA COUPLER

REV. BASIC w/Chg. 2

RF COMMUNICATIONS, INC. ■ ROCHESTER, NEW YORK, U.S.A.

INSTRUCTIONS
for
CHANGE 2
to
Instruction Manual
for
RF-302R Remote Controlled Antenna Coupler
NAVSHIPS 0967-275-2010

The following is a list of pages affected by Change 2:

Page	Instructions
Title Page	Insert immediately following front cover.
2-3/2-4	Remove and replace with page 2-3 Change 2/2-4.
2-5	Remove and replace with page 2-5 Change 2.
3-1/3-2	Remove and replace with page 3-1 Change 2/3-2.
3-3/3-4	Remove and replace with page 3-3 Change 2/3-4 Change 2.
3-5/3-6	Remove and replace with page 3-5/3-6 Change 2.
4-1/4-2	Remove and replace with page 4-1/4-2 Change 2.
5-9/5-10	Remove and replace with page 5-9/5-10 Change 2.
6-1/6-2	Remove and replace with page 6-1 Change 2/6-2.

After carefully checking the manual, destroy the superseded pages.

Digitized by the Internet Archive
in 2024 with funding from
Amateur Radio Digital Communications, Grant 151

https://archive.org/details/rf302rremotecont00unse

PERMANENT CHANGE NO. 1

TO

INSTRUCTION MANUAL/PM-0335

ON

RF-302R

REMOTE CONTROLLED ANTENNA COUPLER

1. GENERAL

1.1 This change is in effect upon receipt and supersedes the pages affected.

1.2 The purpose of this change is to clarify operating procedures, and to correct typographical errors which occurred during printing.

2. PEN-AND-INK CORRECTIONS

2.1 The purpose of making pen-and-ink corrections is to avoid the unnecessary handling of replacement pages that have minor changes. To correct the manual, proceed as follows:

2.1.1 Page 1-2: Add paragraph 1.6, MILITARY NOMENCLATURE.

1.6 MILITARY NOMENCLATURE

The following military nomenclature has been assigned to the RF-302R.

RF-302R	OA-3364/URC-58(V) Antenna Coupler Group
423-0002	CU-1726/URC-58(V) Coupler, Antenna
423-0001	C-7439/URC-58(V) Control, Antenna Coupler

2.1.2 Page 1-2, paragraph 1.5, EQUIPMENT REQUIRED BUT NOT SUPPLIED, and page 6-2, PARTS LIST TABLE:

Add the following "RF-302R Depot Spare Parts Kit, RF P/N 423-0300."

2.1.3 Page 2-1, paragraph 2.6.1 (RF INPUT CABLE), third line. Change "---coaxial cable type RG-84/U, "to read "---coaxial cable type RG-8A/U".

2.1.4 Page 3-2, table 3-1, CONTROL OR INDICATOR Control A, First sentence in FUNCTION Column. Change "---from center (off) position. Coupler unit circuits---" to read "--- from center (off) position, Coupler unit circuits---".

2.1.5 Page 5-3 and 5-4, figures 5-1 and 5-2. Partial callouts are shown on the attached illustrations to permit corrections and additions to the figures in the technical manual. Correct the illustrations in the technical manual as indicated.

2.1.6 Page 5-5, paragraph 5.4.2. Delete step c, and insert the following step c.

"c. Manually rotate coils so that coil roller L1 hits the end stop and rests there. Check the position of the coil L2 roller. If L2 roller is within .09 in. of the end stop, proceed to step f. If not, proceed to step d."

2.1.7 Page 5-2, paragraph 5.3. Add the following sentence to the end of the paragraph, just before the note.

"Lubricate the springs on the A and B controls at the point where they attach to the standoffs on the roller cams, with one drop of the SAE 20 oil mentioned above."

2.1.8 Page 5-6, paragraph 5.4.3, steps k and m. Change "S2" to read "S1".

2.1.9 Page 5-6, paragraph 5.4.3, step p. Change "S1" to read "S2".

2.1.10 Page 1-1. * Note at bottom of page, change " * Use for 208 VAC....." to read, " * Use for 220 VAC.....".

2.1.11 Page 1-1. Paragraph 1.3, second paragraph, fifth line (in center of Page), change "... from a 115 or 230 volt..." to read "from a 115 or 220 volt...".

(OVAL) INDICATES AREAS WHERE CORRECTIONS ARE TO BE MADE TO ILLUSTRATION IN MANUAL.

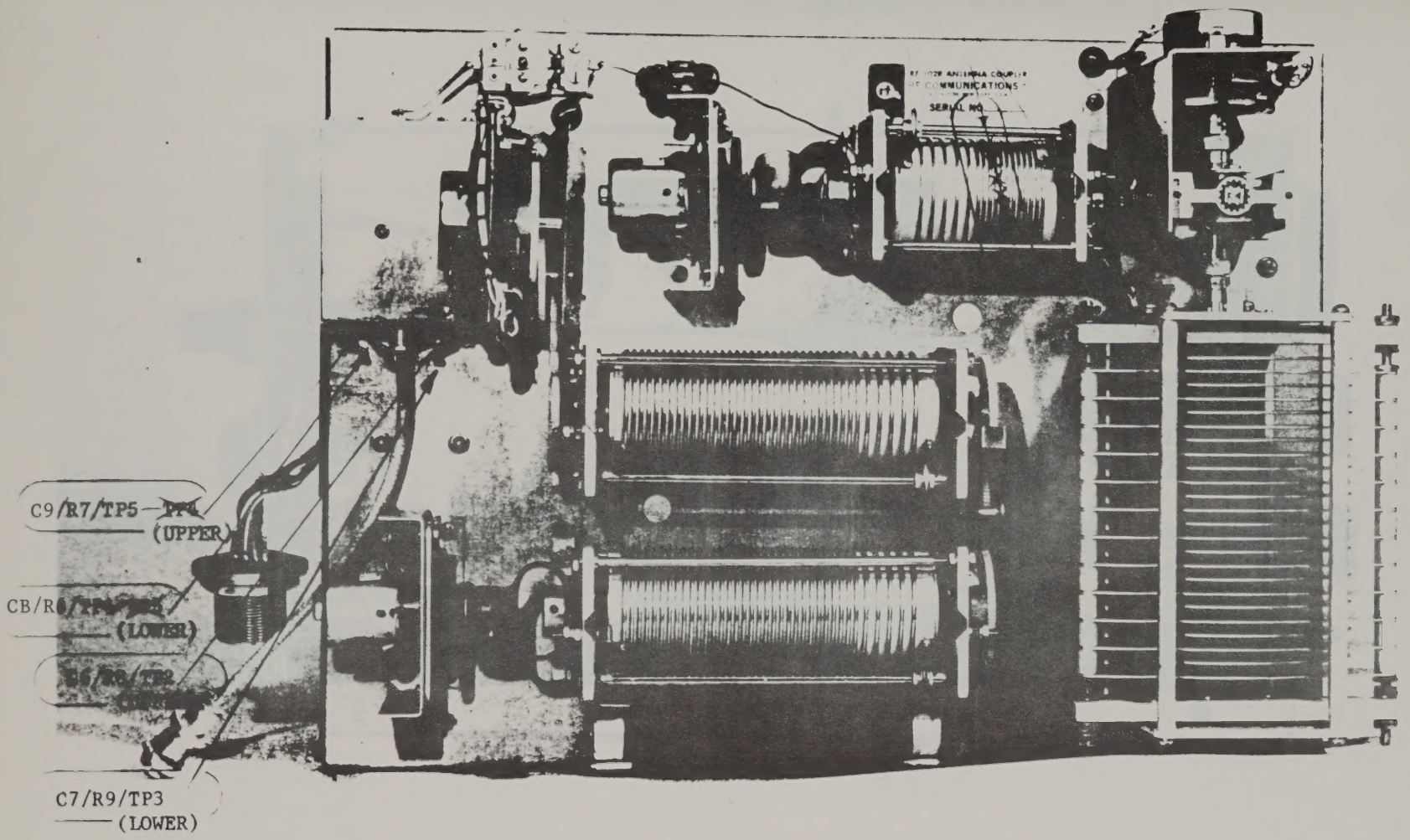


Figure 5.1 - Coupler Unit, Chassis Removed from Case

(OVAL) INDICATES AREAS WHERE CORRECTIONS ARE TO BE MADE TO ILLUSTRATION IN MANUAL.

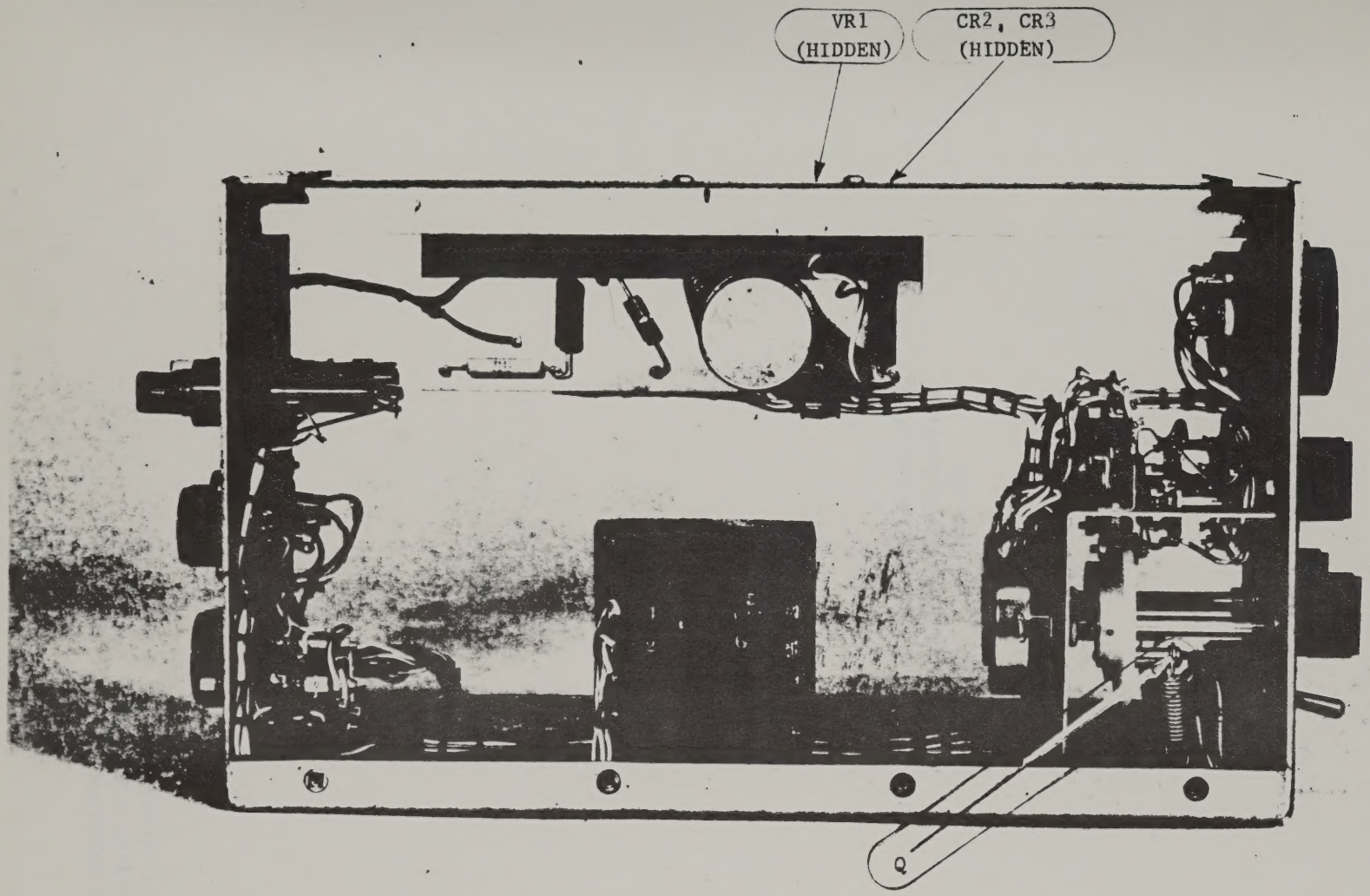


Figure 5.2 - Control Unit Chassis, Cover Removed

NAVSHIPS 0967-275-2010

RF-302R
REMOTE CONTROLLED
ANTENNA COUPLER

PUBLICATION: 14 MARCH 1968
CHANGE 2: 20 NOVEMBER 1969
NAVSHIPS 0967-275-2012

NAVSHIPS 0967-275-2010

TABLE OF CONTENTS

Section		Page
I	**GENERAL INFORMATION**	
	1.1 Purpose	1-1
	1.2 Physical Description	1-1
	1.3 Electrical Description	1-1
	1.4 Equipment Supplied	1-1
	1.5 Equipment Required But Not Supplied	1-2
II	**INSTALLATION**	
	2.1 General	2-1
	2.2 Unpacking and Inspection	2-1
	2.3 Mounting the RF-302R Coupler Unit	2-1
	2.4 Mounting the RF-302R Control Unit	2-1
	2.5 Power Requirements	2-1
	2.6 Connections	2-1
	2.7 Grounding	2-4
III	**OPERATION**	
	3.1 General	3-1
	3.2 Controls and Indicators	3-1
	3.3 Operation Without Prelogged A&B Meter Settings	3-3
	3.4 Operation With Prelogged A&B Meter Settings	3-4
IV	**PRINCIPLES OF OPERATION**	
	4.1 General	4-1
	4.2 RF Signal Path	4-1
	4.3 Discriminator Assembly	4-1
	4.4 Control Circuits	4-3
	4.5 Metering	4-3
	4.6 Troubleshooting	4-4
V	**MAINTENANCE**	
	5.1 General	5-1
	5.2 Preparation for Maintenance	5-1
	5.3 Cleaning and Lubrication	5-2
	5.4 Alignment Procedure	5-2
	5.5 Discriminator Adjustment	5-7
VI	**PARTS LIST**	

LIST OF ILLUSTRATIONS

Figure		Page
2.1	Coupler Unit Mounting Dimensions	2-2
2.2	Control Unit, Rear View	2-3
3.1	Control Unit, Front Panel	3-1
4.1	Remote Controlled Antenna Coupler RF-302R, Functional Block Diagram	4-2
4.2	Meter Network For Element Position Indication	4-4
5.1	Coupler Unit, Chassis Removed from Case	5-3
5.2	Control Unit Chassis, Cover Removed	5-4
5.3	Remote Controlled Antenna Coupler RF-302R, Schematic Diagram	5-9
5.4	Logging Chart	5-11
5.5	Logging Chart	5-12
5.6	Approximate A&B Settings for Whip Antennas	5-13

LIST OF TABLES

Table		Page
2.1	Power Cable Terminations	2-5
3.1	Control Unit, Operating Controls and Indicators	3-3

SECTION I
GENERAL INFORMATION

1.1 PURPOSE

This handbook contains the information necessary for installation, operation, and maintenance of Remote Controlled Antenna Coupler RF-302R. The RF-302R is designed to efficiently match the impedance of a 75 foot long-wire or a 15, 25, or 35 foot whip-type antenna to the 50 ohm transmission line output of a 150 watt HF transmitter over the frequency range of 2 to 26 MC. The RF-302R is a companion unit to the R. F. Communications (Model RF-301) SSB 100 watt Transceiver but can be used with any transceiver or transmitter with a maximum RF output of 150 watts.

1.2 PHYSICAL DESCRIPTION

The RF-302R consists of two equipments: a Coupler unit and a Control unit. The Coupler unit is housed in a ruggedized, waterproof metal case which mounts at the base of an antenna, up to 500 feet from the Control unit. Two input cables, not supplied, are connected to it; a coaxial cable (RF transmission line) from the transmitter, and a multiconductor (14 wires) control cable from the Control unit. The Coupler unit is 24-1/4 inches high, 16 inches wide, 9-1/4 inches deep, and weighs approximately 45 pounds.

The Control unit chassis forms a part of its case. A sturdy wrap-around cover slides over the top and is secured to the chassis to form a splashproof housing for the components. All controls, with the exception of the primary power selector switch and the fuses, are front panel mounted. Cable connections are to the rear. The Control unit is provided with small rubber feet which permit convenient operation from a desk or tabletop, or it may be installed with the RF-301 Transceiver in the RF-305 Shockmount. The Control unit is 9-1/4 inches high, 4-3/4 inches wide, 14-3/4 inches deep, and weighs approximately 9 pounds.

1.3 ELECTRICAL DESCRIPTION

The Coupler unit contains a motor-driven impedance matching network; a 100 watt, 50 ohm RF dummy load; and a discriminator assembly. The Control unit contains a power supply; the control circuits required to position the matching network in the Coupler unit; and meters for monitoring either the output from the Discriminator assembly or the position of the tuning elements in the matching network as selected by the front panel Mode Switch. While tuning the transmitter, a separate position of the Mode switch energizes a relay in the Coupler unit to switch the transmitter RF input to an RF dummy load. When the transmitter RF input is connected to the RF dummy load, lights in the front panel meters flash to alert the operator that the transmitter is not connected to the antenna.

The Coupler unit and Control unit require an operating voltage of 22-30 VDC. This may be supplied directly as primary voltage to the equipment, or the equipment may be operated from a 115 or 230 volt, 50-60 CPS source from which a power supply within the Control unit produces the required 22-30 VDC.

1.4 EQUIPMENT SUPPLIED

The following items constitute a complete Remote Controlled Antenna Coupler RF-302R. For R F Communications part numbers refer to the parts list in section VI.

Coupler unit

Control unit

115 VAC Line Cord Assembly

*Primary Power Connector Kit

**Male Control Cable Connector Kit

**Female Control Cable Connector Kit

*Use for 208 VAC or 22-30 VDC power input.
**Connectors for cable between Control unit and Coupler unit.

Logging Chart

Instruction Manual

1.5 EQUIPMENT REQUIRED BUT NOT SUPPLIED

Multiconductor Cable (14 wire)

Ground Strap

Coaxial Cable and RF connectors

Antenna and lead-in

Transmitter or transceiver

Miscellaneous installation hardware and components

SECTION II
INSTALLATION

2.1 GENERAL

No special procedures are required to install the RF-302R. The equipment supplied is fully adjusted and ready for use as shipped from the factory. However, one important factor should be considered; while the addition of an efficient antenna coupler such as the RF-302R is an improvement for any antenna system, it will not automatically solve all antenna system problems. Antenna sites should be selected with care, and good engineering practices observed for all phases of the installation. The following paragraphs will assist in ensuring that the RF-302R is properly installed.

2.2 UNPACKING AND INSPECTION

The RF-302R is shipped in two cartons. Carefully open both cartons and check the contents against the packing list. If no packing list is available, paragraph 1.4 contains a complete list of the equipment supplied. Carefully inspect both units for signs of damage. If any damage exists, save packing material to substantiate claim with transportation agency.

2.3 MOUNTING THE RF-302R COUPLER UNIT

The importance of mounting the Coupler unit close to the base of the antenna cannot be overstressed. The lead-in wire between the Coupler unit stand-off terminal and the antenna base acts as part of the antenna itself. It not only decreases efficiency, but also significantly impairs the range of operation of the Coupler unit. Therefore, the length of the lead-in should not exceed 1 foot. This dictates that the Coupler unit will be mounted at the base of the antenna. Figure 2-1 illustrates the mounting dimensions. The Coupler unit may be mounted in any plane, but to facilitate maintenance, it should be mounted so that the cover is readily accessible. The Coupler unit can also be installed on tripod mounted antennas.

2.4 MOUNTING THE RF-302R CONTROL UNIT

The Control unit is equipped with rubber feet so that it may be set on any flat surface convenient to the transmitter operator. However, the distance between the Control unit and Coupler unit must not exceed 500 feet. When the RF-302R is used with the RF-301 Transceiver in mobile installations, the RF-301 and the RF-302R Control unit may be mounted together on the RF-305 Shockmount.

2.5 POWER REQUIREMENTS

The RF-302R draws 20 watts maximum power and can operate from any one of three primary power sources: 230 VAC, 50-60 CPS; 115 VAC, 50-60 CPS; or 22-30 VDC. The primary power input is at the rear of the Control Unit (figure 2-2). When making the installation, select the primary power source to be used, and then position the switch on the rear of the Control unit so that the slot in the shaft is aligned with the correct voltage marking.

2.6 CONNECTIONS

The following paragraphs contain information on the cables required with the RF-302R. Since the distance between the transmitter and the Control unit, and the Coupler unit will vary with each installation, RF input and control cables are not supplied.

2.6.1 RF INPUT CABLE.

The RF cable between the transmitter and the Coupler unit connector J1 should be coaxial type RG-84/U, RG-215/U, or a similar 50 ohm impedance type. A type "N" male connector (not supplied), to mate with the Coupler unit connector type UG-556B/U, will be

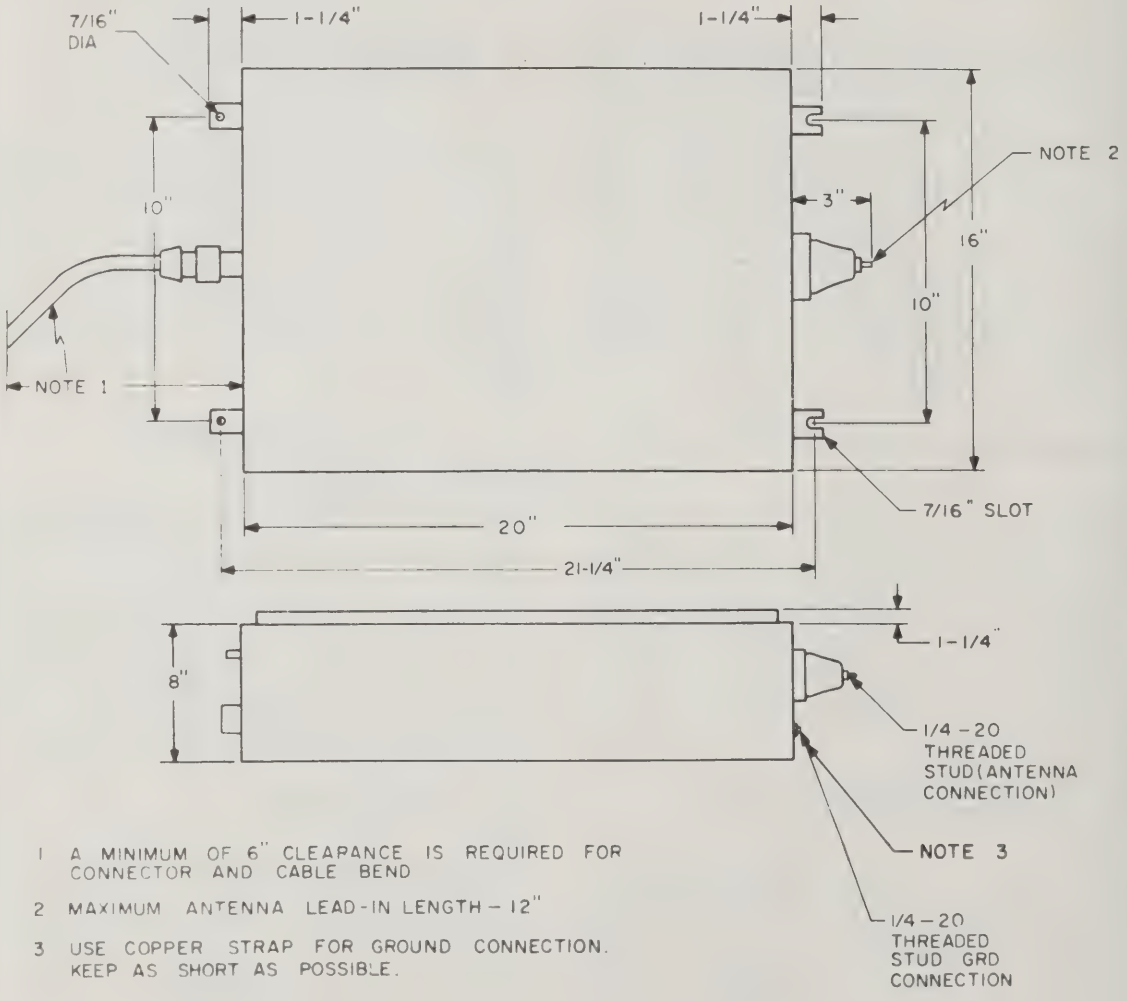


Figure 2.1 – Coupler Unit Mounting Dimensions

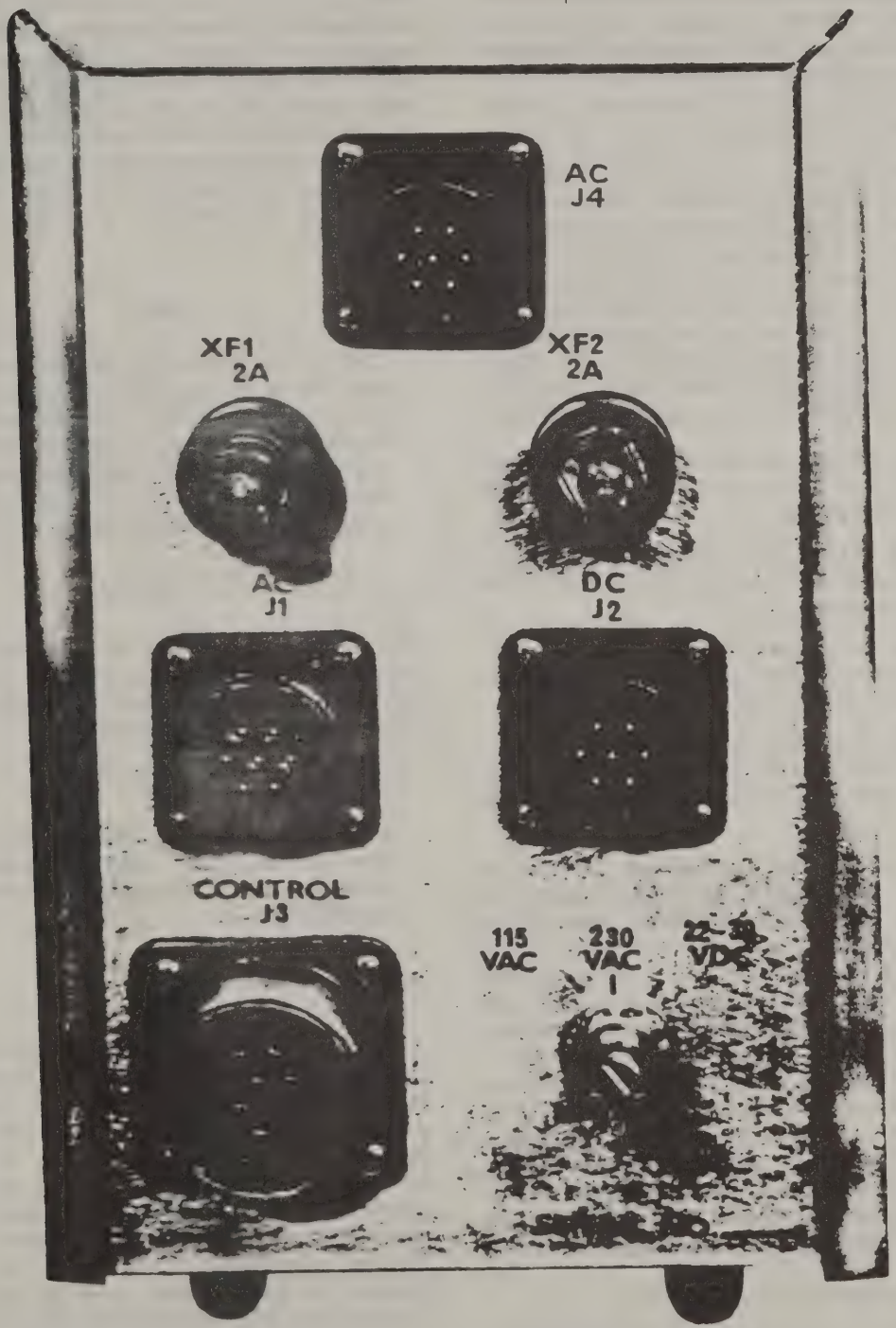


Figure 2.2 – Control Unit, Rear View

required for the Coupler end of the RF cable. For the transmitter end of the RF cable, a connector to mate with the transmitter RF output connector will be required. When the cable assembly is complete, tape the plug which connects to the Coupler unit connector with moisture proof conformal tape.

2.6.2 CONTROL CABLE.

Connectors for the control cable are supplied with the RF-302R. The control cable will use an MS3106A-20-27P connector to mate with the Control unit connector J3, and an MS3106 A-20-27S connector to mate with the Coupler unit connector J2. An MS3057-12B clamp and an AN3420-12A sleeve are furnished with each connector. A shielded multiconductor cable with a minimum of fourteen conductors will be required. Some recommended types are:

a. Type MSCA-14, 14 conductor Armored Cable, O. D. 0.718 maximum, Federal Stock No. GX6145-542-6892

b. Alpha Wire Corp, #1726, 15 conductor, #20 wire cable, nominal O. D. 0.410, Shielded with PVC jacket

c. Alpha Wire Corp, #1255/15, 15 conductor, #20 wire cable, nominal O. D. 0.595, Shielded with a flexible rubber jacket.

d. Alpha Wire Corp, #1459/15, 15 conductor, #18 wire cable, nominal O. D. 0.640, Shielded with heavy duty flexible Neoprene jacket.

Slide the clamp and sleeve over the end of the cable, then solder the conductors to the cable pins. Install the second connector in the same manner, soldering the wire from pin A in the first connector to pin A in the second connector; the wire from pin B in the first to pin B in the second, etc. for all 14 wires. Ground all shields to the connector case. Moisture proof the cable by filling the rear of the connectors with silicone grease (DC-4 or equivalent) and wrap the assembled connection with moisture proof conformal tape. Install the assembled cable by attaching the connectors to the Coupler unit connector J2, and to the Control unit connector J3.

2.6.3 AC LINE CORD ASSEMBLY

The AC line cord assembly (supplied as a part of the RF-302R) is wired for 115 VAC operation. Connect the MS type connector to the Control unit connector J1. A separate connector type MS3106A-16S-1S with an MS-3057-8B clamp and an AN-3420-6A sleeve are supplied for manufacture of a DC cable assembly to connect to J2, if required. See table 2-1 for DC cable connections. If 230 VAC operation is required, either disassemble the 115 VAC cable assembly, and resolder the connections according to table 2-1, or use the MS3106A-16S-1S connector and make the connections according to table 2-1.

Note

The DC and AC cable connections (to J1 and J2 on the rear of the Control unit) are mechanically interchangeable. However, different pin connections prevent the cables from being electrically interchangeable. The RF-302R will be inoperative if a wrong cable is used.

2.6.4 ANTENNA LEAD-IN

The antenna lead-in wire from the Coupler unit to the base of the antenna should not exceed one foot and should be made of AWG No. 10 or larger buss wire.

Note

The antenna lead-in will act as part of the antenna. For efficient operation, keep the antenna lead-in length as short as possible.

2.7 GROUNDING

A good ground should be used with the vertical antenna for efficient radiation. Grounds for long-wire antennas are not as critical, but are still necessary. Use copper strap, (preferred) or braided strap for all ground connections. Keep ground leads as short as possible. This is especially important with the Coupler unit. If the Coupler unit is located physically away from the ground plane, the ground lead acts as part of the antenna and the Coupler unit chassis may be at some high RF voltage above ground, and consequently dangerous.

In vehicular installations, connect the Coupler unit ground terminal to the metal body of the vehicle. The surface should be clean and free from paint at the point of connection.

In fixed station installations, one or two ground rods, of six to eight feet in length can be used, providing that the soil is conductive. A connection to a water pipe system at that point where the pipe comes out of the ground might also serve as a good ground. In dry regions, a system of radials can be buried six to eight inches under the surface of the earth, extending away from the base of the antenna. These radials act as an artifical ground. The radials should be made of heavy gauge wire at least one quarter wave-length long at the lowest operating frequency. A minimum of 4 radials should be used for vertical antennas. For long wire antennas, one or two radials running under the antenna may be sufficient.

Table 2.1 – Power Cable Terminations

CONNECTOR PIN	FUNCTION		
	DC CABLE	230 VAC CABLE	115 VAC CABLE
A	N. C. (no connection)	N.C.	15 VAC
B	N.C.	230 VAC	N.C.
C	N.C.	AC common	AC common
D	Chassis ground	Chassis ground	Chassis ground
E	Plus 22-30 VDC input	N.C.	N.C.
F	DC (minus) Return	N.C.	N.C.
G	22-30 VDC	N.C.	N.C.

SECTION III
OPERATION

3.1 GENERAL

No accessory equipment is needed to tune the RF-302R. The RF-302R may be tuned by one of two methods: Control A and Control B first may be set to the "home" position, and then adjusted for a "null" indication on the center reading meters (using COUPLER TUNE/OPERATE mode); or (if settings have been previously logged) Control A and Control B can be set for the approximate (logged) position (using A & B SET mode), and adjusted for a "null" indication on the center reading meters using COUPLER TUNE/OPERATE mode. For a better understanding of the functional operation of the RF-302R, refer to section IV.

CAUTION

It is generally good practice to tune the RF-302R with no more than 1/2 of the normal transmitter output (nominally 50 watts), since the Coupler unit does not present a proper load to the transmitter until it is correctly tuned. This precludes damage to the transmitter which could result from tuning at full power.

3.2 CONTROLS AND INDICATORS

Figure 3-1 illustrates the front panel of the Control unit, and table 3-1 lists and describes the functions of the various controls and indicators used by the operator.

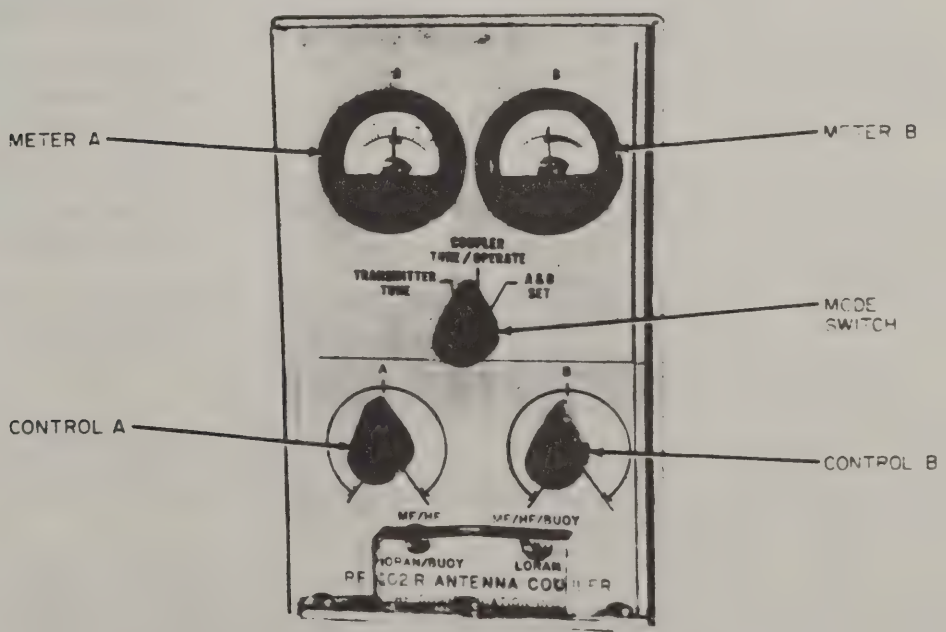


Figure 3.1 – Control Unit, Front Panel

Table 3.1 – Control Unit, Operating Controls and Indicators

CONTROL OR INDICATOR	FUNCTION	
Primary Power swtich	Applies primary power to Control unit circuits when set at ON.	
Mode switch	Selects function of Coupler unit, and of metering circuits in Control unit.	
	SWITCH POSITION	ACTION
	TRANSMITTER TUNE	RF input to Coupler unit is connected to an internal 50 ohm dummy load for transmitter tuning. Meters A and B indicate center "Null". Meter dial lights flash as a reminder that transmitter is not connected to antenna.
	COUPLER TUNE/OPERATE	RF input to Coupler unit is connected through matching network to antenna. Meters A and B monitor input to Coupler unit and indicate center "Null" when matching network is properly tuned.
	A & B SET	RF input to Coupler unit is connected through matching network to antenna. Meters A and B indicate relative position of Coupler unit matching network elements.
Meter A	Monitors Coupler unit input impedance (indicates "Null" when the resistive component of the impedance is 50 ohms) or relative position of shunt tuning elements as selected by Mode switch.	
Meter B	Monitors Coupler unit input impedance (indicates "Null" when RF voltage and current are in phase) or relative position of series tuning elements as selected by Mode switch.	
Control A	When rotated from center (off) position. Coupler unit circuits are energized to change shunt tuning elements in matching network. Speed of change is dependent upon the distance the control is rotated from center position. Direction of change is dependent upon direction of rotation of control from center.	

Table 3.1 – Control Unit, Operating Controls and Indicators (Cont)

CONTROL OR INDICATOR	FUNCTION
Control B	When rotated from center (off) position, Coupler unit circuits are energized to change series tuning elements in matching network. Speed of change is dependent upon the distance the control is rotated from center position. Direction of change is dependent upon direction of rotation of control from center.

Note

Switch A1S1, on the rear of the Control unit, is set for the proper primary power source at the time of installation. The operator will have no cause to change this switch position unless the primary power source is changed.

3.3 OPERATION WITHOUT PRELOGGED A & B SETTINGS

The following procedure is to be followed when tuning the Coupler unit to frequencies for which no previous Meter A & B settings have been logged for the type of antenna in use.

Note

The following procedures should be carefully performed, or a false tune may result,

CAUTION

When operating Control A and Control B, do not allow control to abruptly snap back to off position. Damage to switch may result.

1. Set Power switch at ON.
2. Set Mode switch at TRANSMITTER TUNE. Meter lamps should flash.
3. Tune transmitter to the selected frequency, and adjust the RF output for approximately 25 to 50 watts.
4. Unkey the transmitter.

The tuning procedure described in the following paragraphs for the coupler is divided into three sequences:

1. With the transmitter unkeyed, Coupler controls A and B are preset to zero. (Step a.)
2. With the transmitter keyed, the Coupler is coarse-tuned to a position of greater tuning sensitivity. (Step b.)
3. The Coupler is fine-tuned to its correct tuning point. (Step c.)

a. Coupler Preset

1. Set Mode switch at A and B SET. Meter lamps should stop flashing and remain on.
2. Rotate Control A counterclockwise and hold until meter A indicates near zero (minimum at left).
3. Rotate Control B clockwise and hold until meter B indicates near zero (minimum at right).

Control A and Control B may be operated simultaneously.

b. Coarse-Tuning

CAUTION

Before proceeding, first read and understand the following:

The Coupler is correctly tuned when both meters are reading center scale. Control A tunes Meter A, and Control B tunes Meter B.

During tuning, the direction to turn either control knob can be determined by the position of the respective meter. If the meter needle is to the left of center, the control knob should be rotated clockwise. If the needle is to the right of center, the control knob should be rotated counterclockwise.

The speed of tuning is determined by how far the control knob is rotated. The further it is rotated, the faster the tuning. This speed control is especially helpful near the end of the tuning cycle when sensitivity is usually quite high.

The Coupler will be coarse-tuned when Meter B, which at first has shown little or no movement, suddenly becomes sensitive to tuning and indicates to the right of center.

1. Set Mode switch at COUPLER TUNE/OPERATE. Meters A and B should provide a center scale indication.

2. Key the transmitter and observe the indication of Meters A & B. The deflection from the center position may be small because the antenna coupler is far from its proper tuning position.

Note

Read all of step 3 below before any further coarse-tuning.

3. First, rotate Control B counterclockwise, and hold at least 30 seconds in the maximum counterclockwise position OR until Meter B swings to the right of center, and then adjust for a maximum meter deflection to the right. When meter deflection is observed and adjusted for maximum, the coupler is coarse-tuned and it is not necessary to perform steps 4 and 5 below. However, if no appreciable change or swing occurs on Meter B after Control B is held in a maximum counterclockwise position for 30 seconds, proceed with the alternate coarse-tuning procedure in steps 4 and 5 below.

4. Set Mode switch at A & B SET. Rotate Control A counterclockwise and hold until Meter A indicates near zero (minimum at left.) Then rotate Control B clockwise and hold until Meter B indicates near zero minimum at right. Set Mode switch at COUPLER TUNE/OPERATE and proceed with step 5.

5. Key the transmitter and rotate Control A clockwise until Meter B indicates to the right of center. Adjust for maximum meter indication. The Coupler is now coarse-tuned.

c. Coupler Fine-Tuning

CAUTION

When tuning Control A, Meter B normally will move off center. When this occurs, stop tuning Control A and recenter Meter B with Control B. Try to keep Meter B centered at all times. Alternately perform this until both meters are centered in the black area in the middle of the meter. Meter A should not be allowed to swing to the right during tuning. When it comes to center, area on Meter B is intended as an aid in tuning. It does not indicate an overload or other undesirable electrical condition.

1. First adjust Control B to center Meter B. Keeping Meter B centered with Control B, adjust Control A to center Meter A.

2. The coupler is now fine-tuned and ready for operation when both meters are centered.

d. Adjust transmitter to rated RF power. Due to the increased sensitivity with the higher power it may be desirable to obtain a finer tune by repeating step c.

e. If this frequency will be used again in the future, set Mode switch at A & B SET and record meter positions on the logging chart. Reset Mode switch to TUNE/OPERATE position.

3.4 OPERATION WITH PRELOGGED A & B METER SETTINGS

CAUTION

When operating Control A and Control B, do not allow control to abruptly snap back to off position. Damage to switch may result.

The following procedure is to be followed when Meter A and B settings have been previously logged (figures 5-4 or 5-5) for the frequency and type of antenna to be used, or if there is preset information available for the type of antenna being used on figure 5-6.

3.4.1 Set Primary Power switch at ON. Meter lamps should light.

3.4.2 Set Mode switch at TRANSMITTER TUNE. Meter lamps should flash.

3.4.3 Tune transmitter to the selected frequency and adjust the RF output for 25 to 50 watts.

3.4.4 Unkey transmitter.

3.4.5 Set Mode switch at A & B SET. Meter lamps should stop flashing and remain on.

3.4.6 Observe Meter A indication. Rotate Control A in the direction required to provide a Meter A indication identical to the logged setting.

3.4.7 Observe Meter B indication. Rotate Control B in the direction required to provide a Meter B indication identical to the logged setting.

3.4.8 Set Mode switch at COUPLER TUNE/ OPERATE. Meters A and B should provide a center scale indication.

CAUTION

Before proceeding with Paragraph 3.4.9, first read and understand the following:

The Coupler is correctly tuned when both meters are reading center scale. Control A is used to tune Meter A, and Control B is used to tune Meter B.

During tuning, the direction to turn either control knob can be determined by the position of the respective meter. If the meter needle is to the left of center, the control knob should be rotated clockwise. If the meter needle is to the right of center, the control knob should be rotated counterclockwise.

The speed of tuning is determined by how far the control knob is rotated. The further it is rotated, the faster the tuning. This speed control is especially helpful near the end of the tuning cycle when the sensitivity is usually quite high.

CAUTION

When tuning Control A, Meter B normally will move off center. When this occurs, stop tuning Control A and recenter Meter B with Control B. Try to keep Meter B centered at all times. Alternately perform this until both meters are centered in the black area in the middle of the meter. Meter A should not be allowed to swing to the right during tuning. When it comes to center, area on Meter B is intended as an aid in tuning. It does not indicate an overload or other undesirable electrical condition.

1. First adjust Control B to center Meter B. Keeping Meter B centered with Control B, adjust Control A to center Meter A.
2. The coupler is now fine-tuned and ready for operation when both meters are centered.

d. Adjust transmitter to rated RF power. Due to the increased sensitivity with the higher power it may be desirable to obtain a finer tune by repeating step c.

e. If this frequency will be used again in the future, set Mode switch at A & B SET and record meter positions on the logging chart. Reset Mode switch to TUNE/OPERATE position.

SECTION IV
PRINCIPLES OF OPERATION

4.1 GENERAL

Remote Controlled Antenna Coupler RF-302R consists of two units: a Coupler unit (A2) and a Control unit (A1). The Coupler unit contains the impedance matching network. The Control unit contains the metering and switching circuits required for remote tuning of the motor-driven tuning elements of the Coupler unit matching network. Normally the Coupler unit is mounted at the base of the antenna, while the Control unit is conveniently located near the transmitter. One multiconductor cable interconnects the two units. A separate RF transmission line from the transmitter is connected directly to the Coupler unit. Figure 4-1 illustrates the functional sections of the RF-302R.

4.2 RF SIGNAL PATH

During regular transmissions, the RF output from the transmitter is applied through discriminator assembly A2A1, and through the normally closed contacts of relay A2K1 to the matching network. The purpose of the matching network is to provide an inductance-capacitance combination which will transform the impedance of the antenna to the 50 ohms resistive transmission line from the transmitter at the transmitting frequency. It consists of transformer A2T1, and four variable motor-driven elements: A2L1, A2L2, A2L3 and A2C1. Variable inductors A2L1 and A2L2 are positioned to provide enough reactance (shunt loading) to transform the antenna impedance to an inductive impedance that has a resistive component of 12.5 ohms. Capacitor A2C1 is then positioned to cancel this inductive reactance in the transmission line. Transformer A2T1 has a turns ratio of 2:1. Therefore, the input impedance of the RF-302R will be 50 + j0 ohms. Variable inductor A2L3 extends the tuning range of A2C1.

When Mode switch A1S2 is set at TRANSMITTER TUNE, relay A2K1 is energized, switching the transmitter RF input from the matching network to resistor A2R5, which serves as a 50 ohm 100 watt resistive dummy load for transmitter tuning. When relay A2K1 is energized, flasher A1K1 is also energized. A1K1 interrupts the voltage of Meter A and Meter B dial lights at a constant flashing rate to alert the operator that the transmitter is operating into the dummy load and not the antenna.

4.3 DISCRIMINATOR ASSEMBLY

The discriminator assembly consists of two separate circuits; a phase discriminator, and a resistance discriminator (figure 5-3). The RF transmission line passes through the center of, and serves as the primary winding for toroid transformers A2A1T1 and A2A1T2.

4.3.1 PHASE DISCRIMINATOR.

The function of the phase discriminator (transformer A2A1T1 and associated components) is to sample transmission line voltage and current to produce DC voltages proportional to each which will be equal when the voltage and current are in phase (resistive RF load). Center reading Control unit meter A1M2 (Meter B) is connected across the two DC voltage outputs (paragraph 4.5). When a phase difference exists between the transmission line voltage and current (reactive load) the difference between the two DC voltage outputs will result in a meter deflection proportional to the difference. The following paragraph describes how the phase discriminator functions.

Divider A2A1C1-A2A1R3 (figure 5-3) produces a reference voltage at the center tap of A2A1T1 that is 90 degrees out of phase with the line voltage. The RF transmission line current induces a voltage in A2A1T1 secondary which appears across resistors A2A1R1 and A2A1R2. In reference

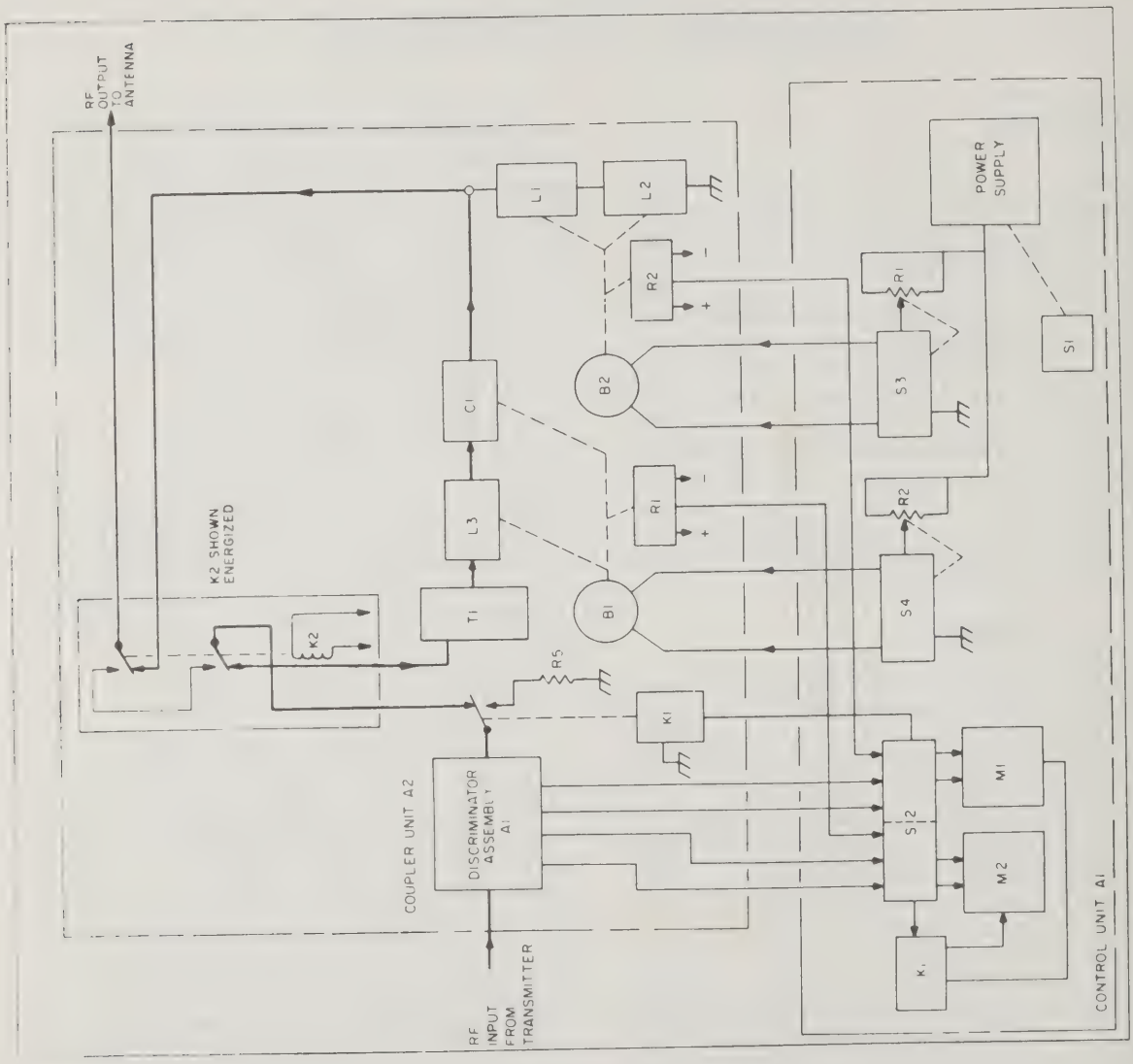


Figure 4.1 – Remote Controlled Antenna Coupler RF-302R, Functional Block Diagram

to A2A1T1 center tap, the voltage drop across A2A1R1 will be 180 degrees out of phase with the voltage drop across A2A1R2. The vector sum of voltages across A2A1R1 and A2A1R3 is detected by A2A1CR1 and filtered by A2A1C2, A2A1C4 and A2A1L1 to produce a DC voltage (referenced to ground) at A2A1TP2. The vector sum of the voltages across A2A1R2 and A2A1R3 is detected by A2A1CR2, and filtered by A2A1C3, A2A1C5, and A2A1L2 to produce a DC voltage (referenced to ground) at A2A1TP3. Any phase difference between transmission line voltage and current will appear as a difference in voltage between A2A1TP2 and A2A1TP3, resulting in a change of Control unit meter A1M2 (Meter B) indication.

4.3.2 RESISTANCE DISCRIMINATOR

The function of the resistance discriminator (transformer A2A1T2 and associated components) is to sample line voltage and current to produce DC voltages proportional to each which will be equal when the transmission line load resistance is 50 ohms. Center reading Control unit meter A1M1 (Meter A) is connected across the two DC voltage outputs (paragraph 4.5). When the transmission line load impedance is other than 50 ohms, the difference between the two DC voltage outputs will result in a meter deflection. The following paragraph describes how the resistance discriminator functions.

Capacitive divider A2A1C6-C7 produces a voltage which is in phase with and proportional to the line voltage. This voltage is detected by diode A2A1CR5, and filtered by A2A1C8, A2A1C10 and A2A1L4, to produce a DC voltage (referenced to ground) at A2A1TP4. At the same time, the line current induces a voltage in A2A1T2 which is 180 degrees out of phase and twice the amplitude (when the resistive component of the impedance is 50 ohms) of the voltage produced by capacitive divider A2A1C6-C7. The vector sum of these two voltages is detected by diode A2A1CR6, filtered by A2A1C9, A2A1C11 and A2A1L5, to produce a DC voltage (referenced to ground) at A2A1TP5. Any change in the transmission line load resistance will result in a change in transmission line current and voltage, which will in turn result in a change in induced voltage in A2A1T2. This will cause the DC voltage at A2A1TP5 to no longer equal the voltage at A2A1TP4, resulting in a change in Control unit meter A1M1 (Meter A) indication.

4.4 CONTROL CIRCUITS

Two DC motors drive the variable elements in the Coupler unit matching network (figure 4-1). Motor A2B1 drives A2L3 and A2C1 while motor A2B2 drives A2L1 and A2L2. DC operating voltage for the drive motors is supplied by the Control unit power supply through switching circuits which permit the operator to select direction and speed of motor rotation. Since the two motor switching circuits are identical, only switching for motor A2B1 is discussed in detail below.

DC operating voltage for A2B1 is applied from the Control unit power supply through switch A1S4 and potentiometer A1R1, and through switches A2S1 and A2S2. A1S4 determines the polarity of the voltage applied to A2B1. A1R1 is in series with the motor, reducing the voltage applied to the motor (and the motor speed). A1S4 and A1R1 are mechanically linked to front panel Control B. Spring tension maintains Control B in a center "off" position, which in turn maintains A1R1 wiper contact at mid range, and A1S4 at off. When Control B is rotated in either direction, A1S4 is actuated, applying voltage to A2B1. As Control B is advanced from its center "off" position the wiper of A1R1 is advanced from the mid-range point (maximum resistance), increasing the voltage applied to A2B1. Switches A2S1 and A2B2 are limit switches, actuated by A2B1 gear train assembly. When A2B1 approaches the high or low end of its range during tuning, one of the limit switches is actuated, switching A2R3 in series with A2B1. This reduces motor speed to prevent mechanical damage and limits current through A2B1 when stalled by the mechanical end stops.

4.5 METERING

The function of the two meters in the Control unit are determined by the position of the Mode switch (figure 5-3). When the Mode switch is set at TRANSMITTER TUNE or

COUPLER TUNE/OPERATE, Meter A1M2 (Meter B) is connected to the output from the phase discriminator; and meter A1M1 (Meter A) is connected to the output from the resistance discriminator. When the Coupler unit is properly tuned, the outputs from the discriminators will provide a center scale "null" indication on Meters A and B (paragraph 4.3).

When the Mode switch is set at A & B SET, meter A1M2 is connected to a voltage divider network which contains potentiometer A2R1 (figure 4-2). The wiper of A2R1 is connected to the A2B1 gear train. Since the indication of A1M2 is dependent upon the position of the A2R1 wiper, A2L3/A2C1 can be rough tuned if the indication for meter A1M2 has been previously logged at that frequency. In a similar manner, meter A1M1 is connected to a voltage divider network which contains potentiometer A2R2, the wiper of which is connected to the A2B2 gear train, providing a means of rough tuning A2L1/A2L2.

4.6 TROUBLESHOOTING

When troubleshooting, use a systematic approach which will quickly isolate the malfunction to a faulty circuit. Carefully check operating procedures to eliminate the possibility of operator error, and read paragraphs 4.1 through 4.5 to develop an understanding of circuit functions. Do not attempt to adjust the discriminator assembly unless you have definite knowledge that the circuit is out of adjustment, due to replacement of parts or accidental maladjustment during troubleshooting.

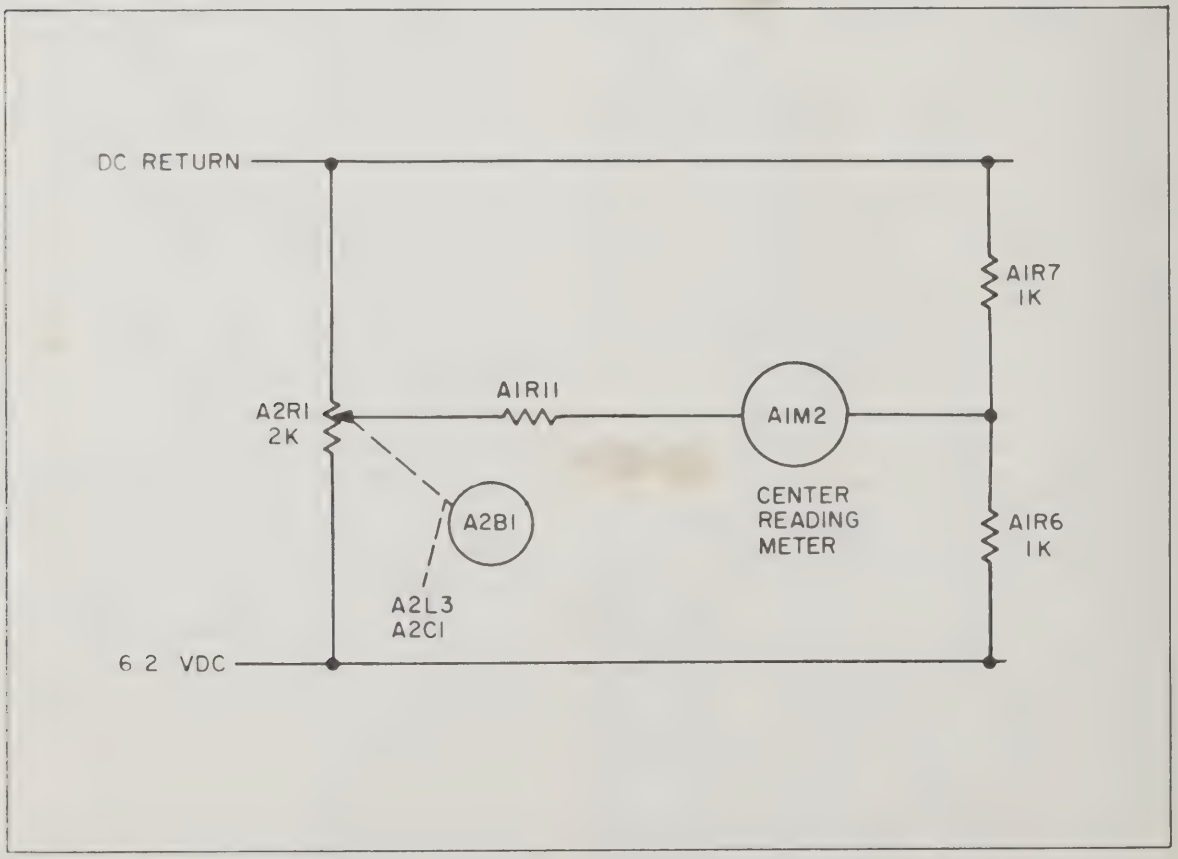


Figure 4.2 – Meter Network For Element Position Indication

SECTION V
MAINTENANCE

5.1 GENERAL

The RF-302R requires a minimum of maintenance. A semi-annual cleaning, lubrication, and tightening of seals is the only preventive maintenance required. Alignment and adjustment will be required only if the initial adjustments have been upset by troubleshooting or parts replacement.

WARNING

Lethal voltages are present within the Coupler unit during transmission. When the Control unit is operated from an AC primary power source dangerous voltages are also present within the Control unit. When performing any maintenance on the equipment, ensure that both the primary power source and the transmitter are turned off and secured.

5.2 PREPARATION FOR MAINTENANCE

When a thorough cleaning and lubrication is planned for the RF-302R, considerable time may be saved if the procedures listed below are observed. When disassembling the equipment, carefully note hardware sequence to assure correct reassembly.

5.2.1 REMOVAL OF COUPLER CHASSIS.

The Coupler unit chassis can be more easily serviced if it is removed from the case and placed on a bench. To do this, proceed as follows:

WARNING

Dangerous RF voltages are present within the Coupler unit when the transmitter is keyed. Always secure the transmitter against accidental keying before working on the Coupler unit.

a. Turn off and secure the transmitter.

b. Disconnect the RF input cable and the control cable.

c. Remove the nut securing each connector to the Coupler unit and push the connector inside the case.

d. Remove the antenna connection from the stud on capacitor A2C1, and carefully bend the copper strap close to the case.

e. Remove the ground strap from the chassis and carefully bend the copper strap close to the case.

f. Remove the six nuts (one from each corner and two in the center) which secure the chassis to the case and lift the chassis out

5.2.2 REMOVAL OF CONTROL UNIT COVER.

The Control unit cover can be removed as follows:

a. Remove the four flat head machine screws from each side of the Control unit cover.

b. Lift the wrap-around cover up off the chassis.

5.2.3 FABRICATION OF TEST CABLE

For bench testing and trouble-shooting, a short control cable for the RF-302R is convenient. Obtain an MS3106A-20-27P connector, and an MS-3106A-20-27S connector. and wire them pin to pin (pin A to pin A, pin B to pin B, etc.). For cable, use any short piece (approximately 2-5 foot long) of multiconductor cable (14 conductors), or use 14 lenths of AWG #20 insulated wire.

5.2.4 TEST EQUIPMENT AND TOOLS REQUIRED

The following test equipment and tools will be required:

JFD Fiber Alignment Tool #5284 or equivalent.

Transmitter or Transceiver with at least 50 W output.

Multimeter, Simpson Model 269 or equivalent.

No. 1 Phillips screwdriver with 12" long shaft.

9/16 open end wrench.

5.3 CLEANING AND LUBRICATION

Periodically, depending on the amount of usage and the operating conditions, the RF-302R should be cleaned and lubricated. It is recommended that this be done approximately every six months. When cleaning, care should be taken not to disturb the mechanical relationship of the components in the separate gear trains and the switch linkages. Use a soft brush and a lint free cloth to remove accumulated dirt and dust. Pay particular attention to the Coupler unit variable coils, the variable capacitor, and gear trains. While cleaning the unit, inspect for signs of excessive wear or damage. Tighten any loose hardware. The shaft bearings on the ends of all three variable coils and those on the ends of the variable capacitor should be lubricated with a drop of SAE 20 weight Pennsylvania motor oil. The roller shafts on the three coils should be lightly greased with Lub-A-Stick silicone grease manufactured by PANEF Manufacturing Co. Inc., Milwaukee 18, Wisconsin. The worm gear on the Millen Gear Drive should be lubricated with Lubriplate Aero grease, and its shaft bushings lubricated with the same SAE 20 oil used on the coils. Finally, all potentiometer bearings and their shaft bearings, both in the Coupler unit and in the Control unit, should be lubricated with one drop of the SAE 20 Pennsylvania motor oil used above. Lubrication points are indicated on figures 5-1 and 5-2 by the letter "Q".

Note

The nylon gears in the Coupler unit gear trains and the gears connected to the motors do not require lubrication.

5.4 ALIGNMENT PROCEDURE

5.4.1 GENERAL

The Coupler unit was carefully aligned at the factory. Parts were securely fastened in place with quality locking devices. Couplings and gears were pinned to shafts to prevent maladjustment. Therefore, there is little likelihood that the alignment would be disturbed. The normal maintenance check would be to tighten all hardware at the time of cleaning and lubrication and then perform the Electrical operation check following the alignment procedure.

If this check indicates an alignment problem, or if a component in the Coupler unit has been replaced which requires re-alignment of that particular section, then the following factory alignment procedure will provide a guide, illustrating the important factors to be considered.

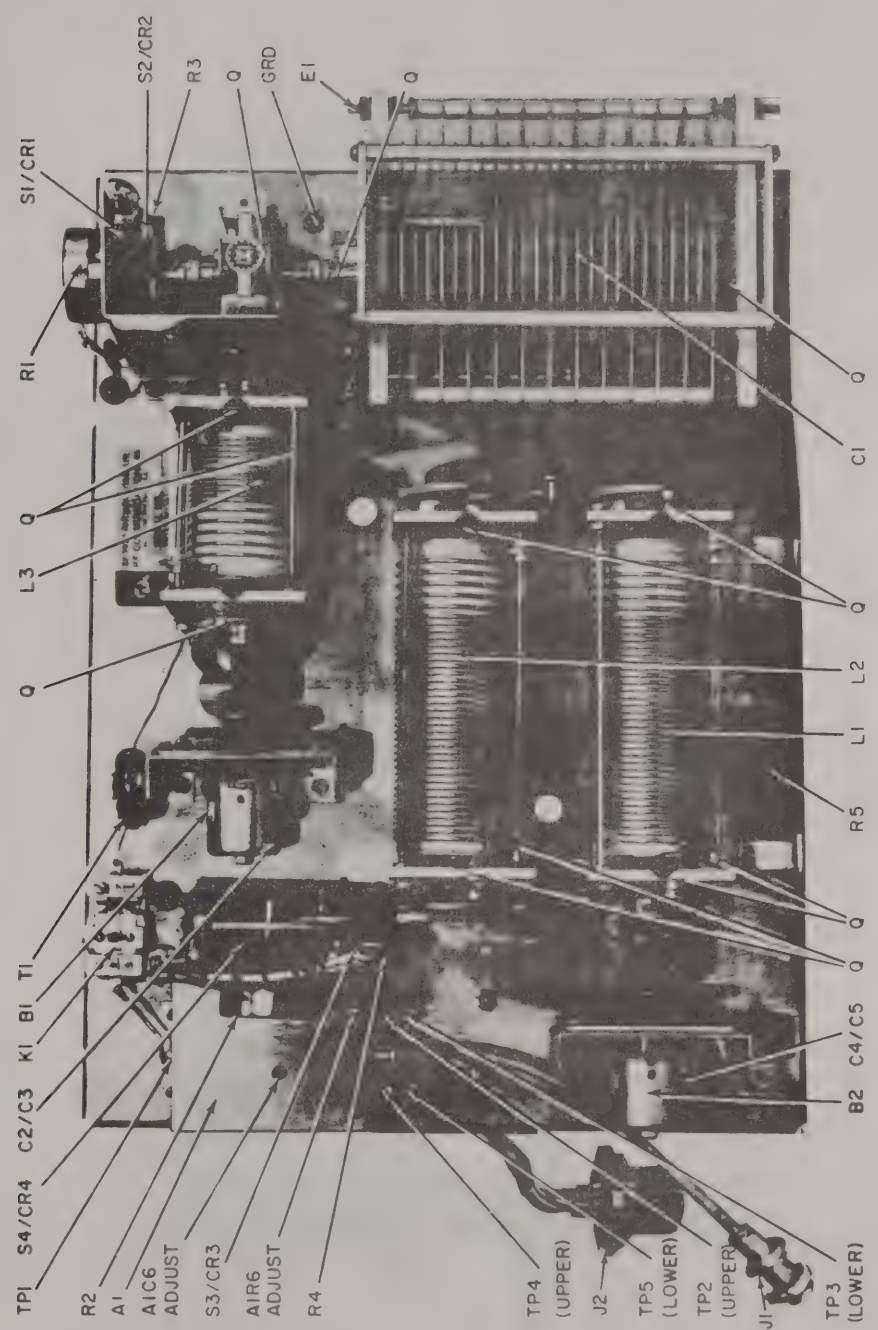
When a component with a pinned coupling on its shaft is replaced, it is recommended that the coupling be repinned using the next larger roll pin to assure proper pinning action.

Connect a tested Control unit to the Coupler unit to be aligned. Turn power on, but do not move any controls.

5.4.2 CONTROL A ALIGNMENT (L1 - L2 ASSEMBLY)

a. Remove the three mounting screws from coil pot drive bracket and tilt the assembly to disengage the gears from the L1 - L2 assembly gears.

b. Lift the roller of L1 and move to turn of coil closest to C1. Place roller on that turn. Do the same with L2. This end of assembly is denoted as the home position of Control A.



PREFIX REFERENCE DESIGNATION A2

Figure 5.1 – Coupler Unit, Chassis Removed from Case

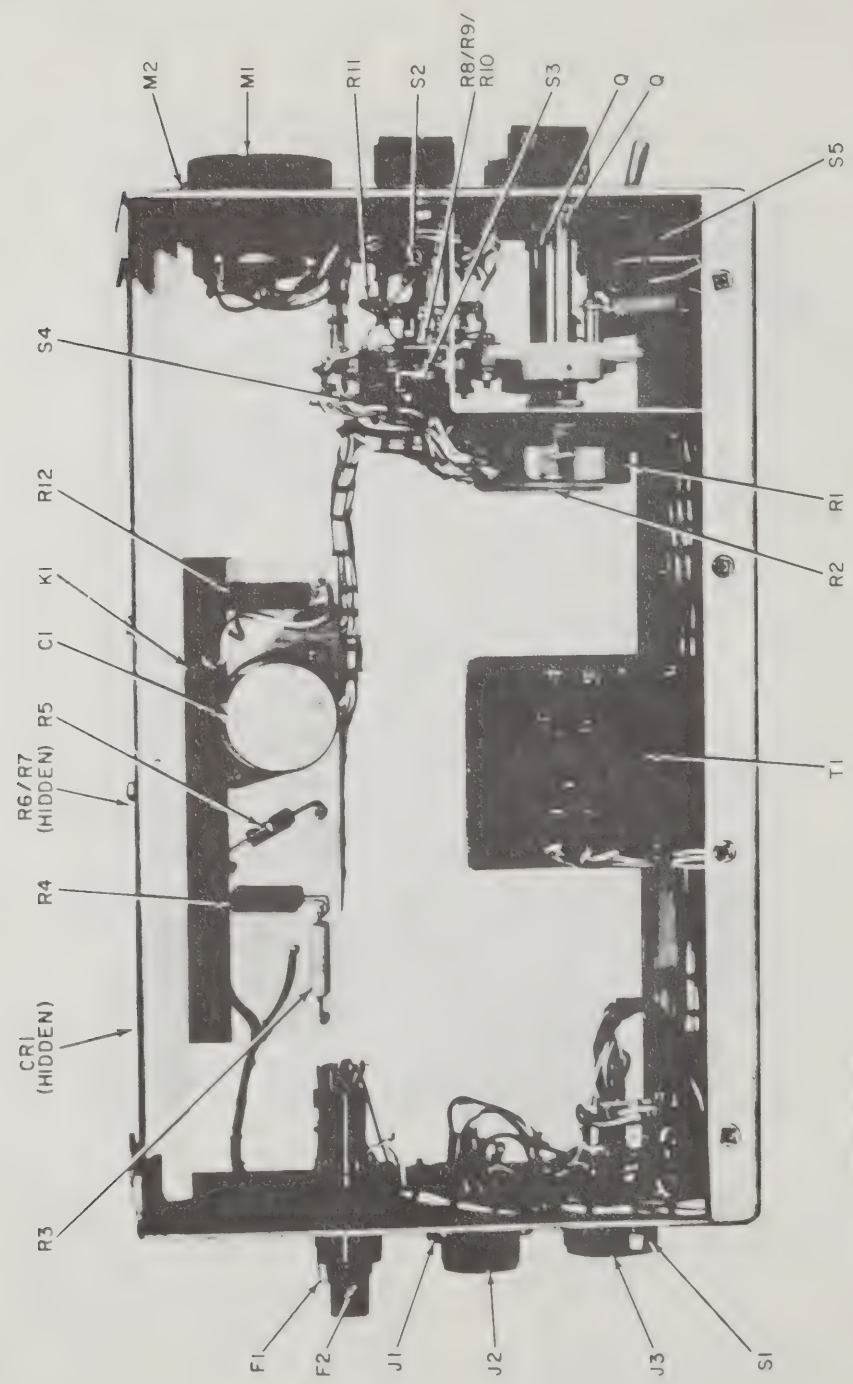


Figure 5.2 – Control Unit Chassis, Cover Removed

c. Manually rotate coils so that one of the two rollers hits the end stop and rests there. Check the position of the roller on the other coil. If the other roller is within .09 of the end stop, proceed to step f. If not, proceed to step d.

d. Loosen and disengage idler gear at end of coil next to C1. Rotate the coil whose roller is not resting against the stop until it does rest against the stop.

e. Re-engage idler gear, being careful to mesh gears properly while maintaining minimum backlash. Be certain that there is no binding caused by the idler gear.

f. Loosen the mounting nut for potentiometer R2 and adjust the position of R2 for proper mesh of the gear affixed to its shaft and the adjoining nylon gear. Tighten the nut moderately.

g. Manually run the potentiometer drive gears until the rollpin in the gear affixed to the potentiometer shaft is positioned opposite the plunger of S3.

h. Install the potentiometer drive assembly so that its drive gear meshes properly with the coil gear, maintaining minimum backlash. Install and tighten the three screws and associated hardware removed in step a.

i. With the Mode switch on the Control unit in the A & B SET position, rotate the body of pot R2 either CW or CCW until Meter A on the Control unit front panel reads zero or minimum, whichever is greater. Be careful not to upset the position of the gears, disturbing their mesh. Securely tighten R2 mounting nut.

j. Check coil drive coupling to ascertain that the screw in the coil end plate does not hit the coil drive coupling. Also, check that copper strap on end of coil does not interfere with coupling rotation.

k. Turn Control A on Control unit front panel in a CW direction until the coil moves one turn away from the home end stop.

1. Adjust lever switch S3 to activate at this point. That is if the coil were moving towards home, the switch would activate at this point. Make certain that the roll pin would continue to depress the switch actuator as it moved towards home, ensuring that the switch will always activate. Tighten down S3. Be careful not to allow roll pin to fall behind the actuator where it would jam.

m. Run coils to one turn from the end opposite the home end of the coils. Adjust the position of switch S4 in a manner similar to step 1 except the switch shall further depress as the coil runs farther away from the home end. Tighten down S4.

n. Check action of switch at both ends to ensure that they activate when the coil is one turn (+120° - 60°) from their respective ends. Readjust switches if neccesary.

5.4.3 CONTROL B ALIGNMENT (L3-C1 ASSEMBLY)

a. Position L3 assembly approximately parallel to the edge of the chassis and tighten it down.

b. Move drive motor assembly so that its output shaft is axially aligned with the L3 drive shaft (±1/32).

c. Make certain that the screw behind the coil drive coupling (motor end) does not interfere with the coupling.

d. Make certain that the strap on the motor end of the coil does not interfere with the coupling.

e. Loosen the set screws on the Rembrandt coupling between the Millen gear and potentiometer R1. Also, loosen those on coupling between Millen gear drive and C1.

f. Move the Millen drive horizontally and vertically until its input shaft is axially aligned with the output shaft of L3 (±1/32).

g. With the Millen drive still aligned per step f, check for squareness with the chassis. Place gear drive for proper coupling mesh into L3 and tighten down drive.

h. Place L3 roller at end of coil nearest motor. Manually rotate coil until the roller

rests against the end stop. This is the home reference point for Control B.

i. Loosen R1 and position so that its shaft is axially aligned with the Millen drive shafts (±1/32). Tighten down moderately.

j. Turn Control B on the Control unit front panel CCW, and run L3 until it is one turn from the home end.

k. Manually turn R1 shaft until the roll pin in its gear is halfway up the trip lever of S2.

l. Tighten the set screws on the Rembrandt coupling between the pot and Millen gear drive.

m. Adjust S2 so that it activates at the point where the coil is one turn from the home end, using a procedure similar to that in step 1 of paragraph 2.4.2. Tighten down S2.

n. Run coil back home and turn the body of Potentiometer R1 CW or CCW until Meter B on the Control unit reads zero or minimum, whichever is greater. Tighten R1 securely, making certain that its alignment has not been disturbed.

o. Rotating Control B on the Control unit front panel CCW, run the motor until L3 is one turn from the end opposite the home end.

p. Adjust lever switch S1 until it just activates at this point using a manner similar to step m of paragraph 2.4.2. Tighten down S1.

q. Run L3 to end stop at end opposite home end.

r. Adjust position of C1 horizontally and vertically so that its shaft is axially aligned with Millen gear drive shafts. Tighten down C1. Note: If alignment cannot be made within ±1/64, move Millen drive until it can and then allow the resulting axial misalignment to L3. If Millen drive has been moved, then repeat steps i, j, m, o, and p being careful not to rotate R1.

s. Rotate C1 rotor so that rotor plates are completely unmeshed with stator plates, and the distance between the rotor plates and stator plates is the same on each side of the capacitor.

t. Tighten down the coupling between the capacitor and Millen gear drive.

u. Run "B" assembly end to end to check for operation of switches in a manner similar to step n of paragraph 2.4.2.

v. Pin all couplings and remove all set-screws.

5.4.4 ELECTRICAL OPERATION CHECK

a. Using Control A on Control unit front panel, check to make certain that Meter A goes to zero ± 1 division when Control A is rotated CCW and the L1-L2 assembly goes to the home position. (Mode switch on Control unit should still be at A & B SET.) Meter A should read approximately 20 when the assembly is at end opposite home.

b. Make certain that when coil assembly is one turn from either end, the motor slows down and that coil assembly slowly runs into the end stop.

c. Using Control B on the Control unit front panel, check to make certain that Meter B goes to 0 ± 1 division when Control B is rotated CW and the L3 coil assembly runs in the home direction. Meter B should read approximately 20 when the coil is at end opposite home.

d. Make certain that the motor slows down when the coil is one turn from either end and that the coil assembly slowly runs into the end stop.

e. Set Mode switch at TRANSMITTER TUNE. Note that relay armature is down and check resistance of RF input connector with an ohm meter. Resistance should be approximately 50 to ground. Meters A and B should both read 10.

f. Set Mode switch at COUPLER-TUNE/OPERATE. Note that resistance between RF input and ground should read approximately zero ohms. (Relay armature should be up). Meters A and B should both read 10.

g. Set Mode switch at A & B SET. Note that resistance between RF input and ground is still approximately zero and that the relay's armature is still up.

h. Check all hardware affecting alignment for tightness.

i. Alignment and DC tests are now completed.

5.4.5 CONTROL A ALIGNMENT

a. Check position of R1 for proper meshing of slot in plastic cam with nylon idler in switch S3 assembly. Note also that shaft from R1 to knob on front panel should be capable of being parallel to the sides of the chassis by moving shaft bearing at knob end. Move potentiometer R1 to accomplish this as necessary.

b. Move Control A shaft bearing on front panel until the shaft is parallel with respect to the sides of the case. Check for alignment by rotating knob 90° in each direction and then releasing knob. Knob must return to center position by itself. When knob turns freely tighten down bearing nut on back of front panel securely and tighten potentiometer R1 locking nut securely.

c. Check freedom of action again to assure that alignment did not move during tightening.

5.4.6 CONTROL B ALIGNMENT

Check alignment of Control B, potentiometer R2, and switch S4 using steps a through c of paragraph 5.4.5.

5.5 DISCRIMINATOR ADJUSTMENT

WARNING

The alignment of the discriminator will require an RF input to the Coupler unit. Be very careful when making adjustments. Dangerous voltages will be present.

The discriminator used in this Coupler unit is a passive device. There are no components which would normally deviate with age causing misadjustment. Therefore, before one decides that the discriminator is in need of adjustment he should be absolutely certain that no other part of the Coupler unit is causing the discriminator to produce error signals.

Poor contact resistance at the dummy load, poor relay contact resistance, and other similar problems would be far more likely to cause such error signals then would a faulty discriminator.

One must bear in mind that the discriminator is the main element in the accomplishment of proper tuning and that, therefore, all adjustments to it must be made with care.

It is recommended that the discriminator should be adjusted by the factory, where adequate test equipment is present to do a thorough job. To accomplish this, if one determines a discriminator problem, he should make the required emergency alignments outlined below, purchase a spare discriminator from the factory, and return the original one for factory alignment.

To check the discriminator adjustment, set the Mode switch at TRANSMITTER TUNE, with the equipment energized, and with an RF input of approximately 100 watts at 10 MC from the transmitter. With the transmitter operating into the 50 ohm dummy load of the Coupler unit, Meter A and Meter B should indicate within one division of null. If adjustment is required, proceed as follows.

5.5.1 De-energize and secure the equipment.

Note

It is not necessary to remove the Coupler unit from its case, if Coupler unit and Control unit are both easily accessable.

5.5.2 Remove the Coupler unit from its case, according to paragraph 5.2.1.

5.5.3 Connect the Coupler unit to the Control unit using the short test cable fabricated in paragraph 5.2.3.

5.5.4 Energize the Control unit and the transmitter. Set the Control unit Mode switch

at TRANSMITTER TUNE. Set the transmitter for an output of 100 watts at 10 MC, and key.

5.5.5 Carefully insert the alignment tool through the opening for C6 in the top of discriminator assembly A1 (see figure 5-1). Adjust C6 for a center "null" reading on the Control unit Meter A.

5.5.6 Carefully insert the alignment tool through the opening for R6 in the top of discriminator assembly A1 (see figure 5-1). Adjust R6 for a center "null" reading on the Control unit Meter B.

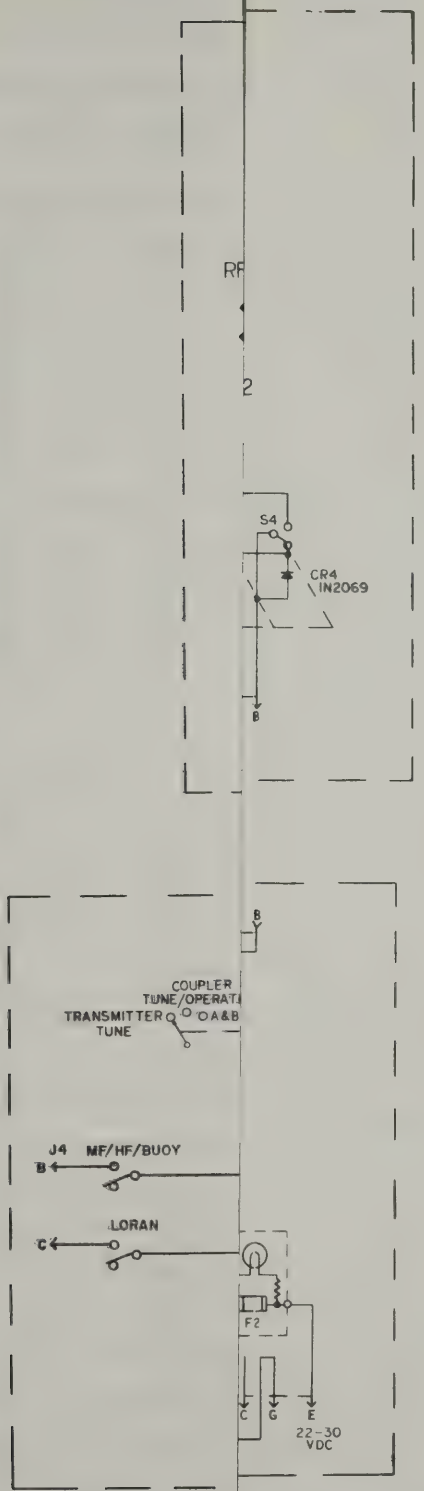
5.5.7 Tune the transmitter to 2 MC and key. Both meters should indicate within three divisions of null.

5.5.8 Unkey the transmitter.

5.5.9 Tune the transmitter to 15 MC and key. Both meters should indicate within three divisions of null.

5.5.10 Unkey the transmitter. De-energize and secure the transmitter and Control unit.

5.5.11 Return the Coupler unit to its case.



NOTES:
1. ALL RESISTOR IN OMHS, ½ WATT 10% UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS IN UF UNLESS OTHERWISE NOTED.
3. ALL INDUCTORS IN UH UNLESS OTHERWISE NOTED.

Figure 5.3 – Remote Controlled Antenna Coupler RF-302R, Schematic Diagram

at TRANSMITTER TUNE. Set the transmitter for an output of 100 watts at 10 MC, and key.

5.5.5 Carefully insert the alignment tool through the opening for C6 in the top of discriminator assembly A1 (see figure 5-1). Adjust C6 for a center "null" reading on the Control unit Meter A.

5.5.6 Carefully insert the alignment tool through the opening for R6 in the top of discriminator assembly A1 (see figure 5-1). Adjust R6 for a center "null" reading on the Control unit Meter B.

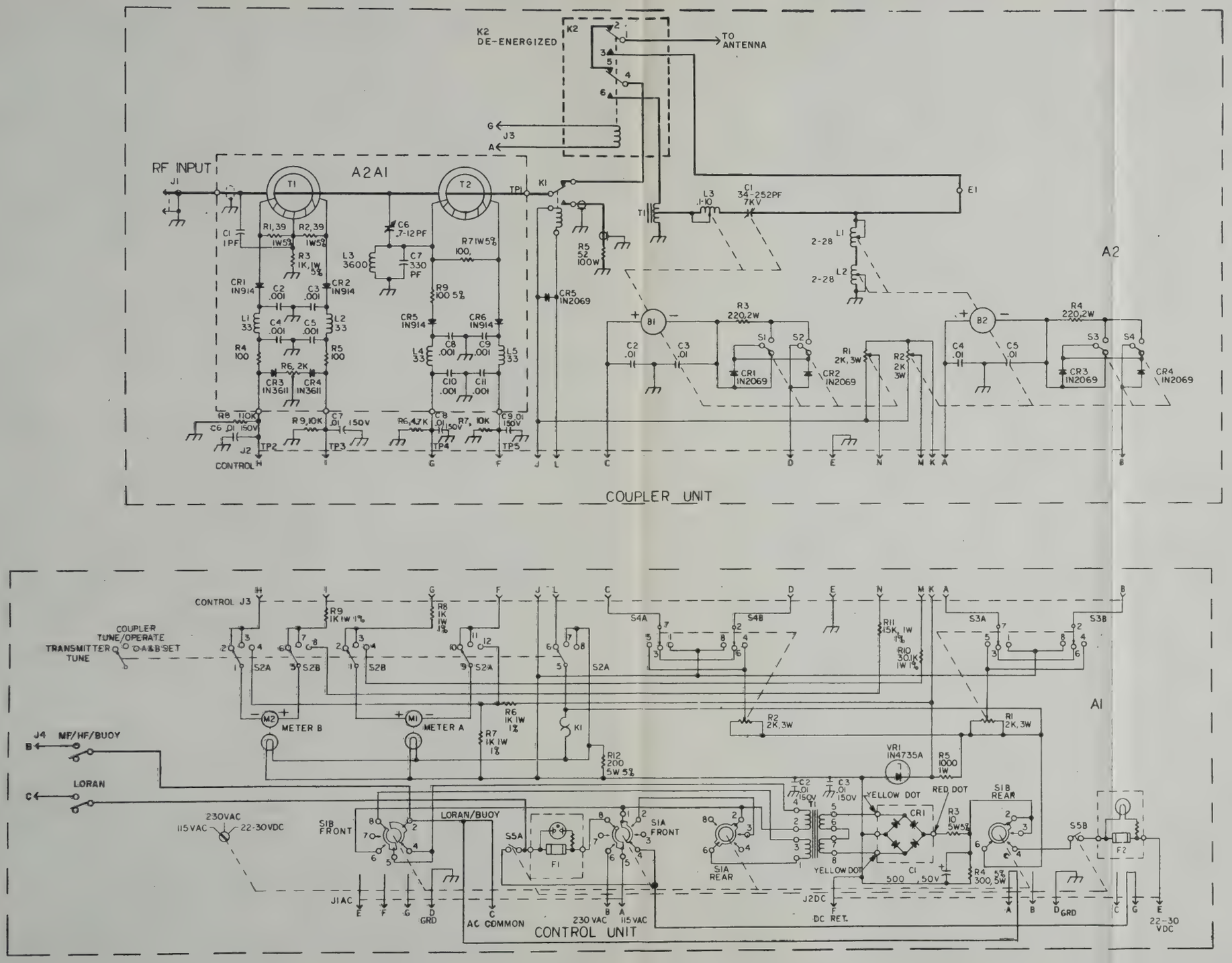
5.5.7 Tune the transmitter to 2 MC and key. Both meters should indicate within three divisions of null.

5.5.8 Unkey the transmitter.

5.5.9 Tune the transmitter to 15 MC and key. Both meters should indicate within three divisions of null.

5.5.10 Unkey the transmitter. De-energize and secure the transmitter and Control unit.

5.5.11 Return the Coupler unit to its case.



NOTES:
1. ALL RESISTOR IN OMHS, ½ WATT 10% UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS IN UF UNLESS OTHERWISE NOTED.
3. ALL INDUCTORS IN UH UNLESS OTHERWISE NOTED.

Figure 5.3 – Remote Controlled Antenna Coupler RF-302R, Schematic Diagram

ANTENNA TYPE _____

FREQ(MC)	A	B

FREQ(MC)	A	B

ANTENNA TYPE _____

FREQ(MC)	A	B

FREQ(MC)	A	B

Figure 5.4 – Logging Chart

ANTENNA TYPE _____

FREQ(MC)	A	B

FREQ(MC)	A	B

ANTENNA TYPE _____

FREQ(MC)	A	B

FREQ(MC)	A	B

Figure 5.5 – Logging Chart

Freq.	35 Ft. Whip		25 Ft. Whip		15 Ft. Whip	
	A	B	A	B	A	B
2.0MC	12.0	12.0	14.7	16.0	18.5	16.0
3.0	6.5	10.7	8.0	14.7	10.2	16.5
4.0	3.2	9.5	5.0	13.0	6.5	16.0
5.0	2.0	10.0	3.5	13.5	5.0	16.5
6.0	1.0	9.5	2.0	12.0	3.8	15.5
7.0	1.5	11.0	1.5	12.0	2.8	15.0
8.0	2.0	12.7	1.0	12.2	2.0	15.5
9.0	2.0	14.0	1.0	13.0	1.8	16.0
10.0	2.0	15.0	1.5	14.0	1.5	15.5
11.0	2.0	16.0	1.7	15.0	1.0	15.0
12.0	1.5	16.2	1.5	15.5	1.0	15.0
13.0	1.5	16.7	1.5	16.0	1.0	15.2
14.0	1.2	17.0	1.2	16.5	1.0	15.5
15.0	1.0	17.5	1.2	17.0	1.0	16.0
16.0	1.0	17.5	1.2	17.2	1.0	16.2
17.0	1.0	17.5	1.0	17.7	1.0	16.7
18.0	1.0	17.5	1.0	18.0	1.0	17.0
19.0	1.0	17.0	1.0	18.0	1.0	17.5
20.0	1.0	17.0	1.0	18.2	1.0	17.5
21.0	1.0	17.2	1.0	18.5	1.0	18.0
22.0	1.0	17.7	1.0	18.7	1.0	18.2
23.0	1.0	18.0	1.0	18.7	1.0	18.3
24.0	1.0	18.2	1.0	18.7	1.0	18.7
25.0	1.0	18.7	1.0	18.5	1.0	18.7
26.0	1.0	19.0	1.0	18.2	1.0	19.0

Figure 5.6 – Approximate A&B Settings for Whip Antennas

SECTION VI
PARTS LISTS

DESIG	DESCRIPTION	RF P/N
A1	Control Unit	423-0001
A2	Coupler Unit	423-0002
	115 VAC Line Cord Assembly	423-0050
	Primary Power Connector Kit	423-0053
	Male Control Cable Connector Kit	423-0056
	Female Control Cable Connector Kit	423-0057
	Logging Chart	423-0054
	Instruction Manual	PM-0335
A1C1	Capacitor, Fixed Electrolytic, Twist Prong, 500UF, 50 VDCW	C23-0001-001
A1C2	Capacitor, Fixed Ceramic, .01UF, 150V	CK63AW103M
A1C3	Capacitor, Fixed Ceramic, .01UF, 150V	CK63AW103M
A1CR1	Rectifier, 1Ø, Full Wave	D22-5003-003
A1F1	Fuse, 2A, 3AG, 250V	F02A250V2A
A1F2	Fuse, 2A, 3AG, 250V	F02A250V2A
A1J1	Connector, Chassis Mount, 7 pin	MS3102A16S-1P
A1J2	Connector, Chassis Mount, 7 pin	MS3102A16S-1P
A1J3	Connector, Chassis Mount, 14 pin	MS3102A20-27S
A1K1	Flasher, Lamp	K90-0001-000
A1M1	Meter A	423-0046
A1M2	Meter B	423-0047
A1R1	Resistor Assembly	423-0001-60
A1R2	Resistor Assembly	423-0001-60
A1R3	Resistor, Fixed Wirewound, 10 ohm, 5%, 5W	RW55G100
A1R4	Resistor, Fixed Wirewound, 300 ohm, 5%, 5W	RW55G301
A1R5	Resistor, Fixed Composition, 1K ohm, 10%, 1W	RC32GF102K
A1R6	Resistor, Fixed Composition, 1K ohm, 1%, 1W	R16-0001-193
A1R7	Resistor, Fixed Composition, 1K ohm, 1%, 1W	R16-0001-193
A1R12	Resistor, Fixed Wirewound, 200 ohm, 5%, 5W	RW55G201
A1S1	Switch, Power, Rotary	423-0045
A1S2	Switch, Rotary	423-0005
A1S3	Switch, Modified Rotary, Lever Action, DPDT	423-0009
A1S4	Switch, Modified Rotary, Lever Action, DPDT	423-0009
A1S5	Switch, Toggle	MS25100-23
A1T1	Transformer, Step-Down	423-0038
A1VR1	Voltage Regulator, Zener	1N4735A
A1XF1	Fuseholder, Indicating	J50-0002-001
A1XF2	Fuseholder, Indicating	J50-0003-001
	Spring	Z20-0001-302
A2B1	Motor, Low Speed, 24 VDC	B11-0003-000
A2B2	Motor, Low Speed, 24 VDC	B11-0003-000
A2C1	Capacitor, Variable	423-0058
A2C2	Capacitor, Fixed Ceramic,. 01UF, 600V	C11-0001-021
A2C3	Capacitor, Fixed Ceramic,.01UF, 600V	C11-0001-021
A2C4	Capacitor, Fixed Ceramic,.01UF, 600V	C11-0001-021
A2C5	Capacitor, Fixed Ceramic,.01UF, 600V	C11-0001-021
A2C6	Capacitor, Fixed Ceramic,.01UF, 150V	CK63AW103M
A2C7	Capacitor, Fixed Ceramic,.01UF, 150V	CK63AW103M
A2C8	Capacitor, Fixed Ceramic,.01UF, 150V	CK63AW103M
A2C9	Capacitor, Fixed Ceramic,.01UF, 150V	CK63AW103M
A2CR1	Diode	1N2069
A2CR2	Diode	1N2069
A2CR3	Diode	1N2069
A2CR4	Diode	1N2069
A2CR5	Diode	1N2069
A2J2	Connector, Chassis Mount, 14 pin	J10-0002-000
A2K1	Relay, SPDT, DC	K30-0005-003
A2L1	Inductor, Variable Rotary, 28 UH	423-0002-150
A2L2	Inductor, Variable Rotary, 28 UH	423-0002-153
A2L3	Inductor, Variable Rotary, 10 UH	423-0002-180
A2R1	Resistor Assembly, Control A	423-0002-50
A2R2	Resistor Assembly, Control B	423-0002-45
A2R3	Resistor, Fixed Composition, 220 ohm, 10%, 2W	RC42GF221K
A2R4	Resistor, Fixed Composition, 220 ohm, 10%, 2W	RC42GF221K
A2K2	Coax Switch	Amphenol 360-11895-48

DESIG	DESCRIPTION	RF P/N
A2R5	Resistor, Fixed Composition, 52 ohm, 10%, 100W	R90-0001-000
A2R6	Resistor, Fixed Composition, 4.7K ohm, 10%, 1/2W	RC20GF472K
A2R7	Resistor, Fixed Composition, 10K ohm, 10%, 1/2W	RC20GF103K
A2R8	Resistor, Fixed Composition, 10K ohm, 10%, 1/2W	RC20GF103K
A2R9	Resistor, Fixed Composition, 10K ohm, 10%, 1/2W	RC20GF103K
A2S1	Switch, Sensitive, SPDT	S80-0001-000
A2S2	Switch, Sensitive, SPDT	S80-0001-000
A2S3	Switch, Sensitive, SPDT	S80-0001-000
A2S4	Switch, Sensitive, SPDT	S80-0001-000
A2T1	Transformer, RF	423-0048
	Insulator Bowl	E11-0001-000
	Washer, Shoulder Insulating	E12-0001-009
	Worm Drive	423-0002-65
	Coupling, Motor Drive	423-0016
	Coupling, Cap Drive	Z06-0006-001
	Gear, Combination	Z07-0001-001
	Coupling, Nylon Insert	423-0067-2
	Coupling, Hub, Modified	432-0067-1
A2A1	Discriminator Assembly	423-0064
A2A1C1	Capacitor, Fixed Porcelain, 1 PF, 500 VDCW	CY12C1R0C
A2A1C2	Capacitor, Fixed Ceramic, 1000 PF, 1000 VDCW	CK60AW102M
A2A1C3	Capacitor, Fixed Ceramic, 1000 PF, 1000 VDCW	CK60AW102M
A2A1C4	Capacitor, Fixed Ceramic, 1000 PF, 1000 VDCW	CK60AW102M
A2A1C5	Capacitor, Fixed Ceramic, 1000 PF, 1000 VDCW	CK60AW102M
A2A1C6	Capacitor, Variable Glass, 0.7 - 12 PF	PC41J8R5
A2A1C7	Capacitor, Fixed Mica, 330 PF, 500 VDCW	CM05D331J03

DESIG	DESCRIPTION	RF P/N
A2A1C8	Capacitor, Fixed Ceramic, 1000 PF, 1000 VDCW	CK60AW102M
A2A1C9	Capacitor, Fixed Ceramic, 1000 PF, 1000 VDCW	CK60AW102M
A2A1C10	Capacitor, Fixed Ceramic, 1000 PF, 1000 VDCW	CK60AW102M
A2A1C11	Capacitor, Fixed Ceramic, 1000 PF, 1000 VDCW	CK60AW102M
A2A1CR1	Diode	1N914
A2A1CR2	Diode	1N914
A2A1CR3	Diode	1N4003
A2A1CR4	Diode	1N4003
A2A1CR5	Diode	1N914
A2A1CR6	Diode	1N914
A2A1J1	Connector, Coaxial, RF	UG-556B/U
A2A1L1	Coil, RF, 33 UH	MS18130-26
A2A1L2	Coil, RF, 33 UH	MS18130-26
A2A1L3	Coil, RF, 3600 UH	L10-0002-054
A2A1L4	Coil, RF,33 UH	MS18130-26
A2A1L5	Coil, RF,33 UH	MS18130-26
A2A1R1	Resistor, Fixed Film, 39 ohms, 5%, 1W	RL32AD390J
A2A1R2	Resistor, Fixed Film, 39 ohms, 5%, 1W	RL32AD390J
A2A1R3	Resistor, Fixed Film, 1000 ohms, 5%, 1W	RL32AD102J
A2A1R4	Resistor, Fixed Film, 100 ohms, 5%, 1/2W	RL20AD101J
A2A1R5	Resistor, Fixed Film, 100 ohms, 5%, 1/2W	RL20AD101J
A2A1R6	Resistor, Variable Wirewound, 2000 ohms	RT11C2P202
A2A1R7	Resistor, Fixed Film, 100 ohms, 5%, 1W	RL32AD101J
A2A1R9	Resistor, Fixed Film, 100 ohms, 5%, 1/2W	RL20AD101J
A2A1T1	Transformer, RF, Toroid	T10-0002-000
A2A1T2	Transformer, RF, Toroid	T10-0001-000
	Termination, RF	MX-1530/U

☆ U. S. GOVERNMENT PRINTING OFFICE: